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ABSTRACT

This document presents some of the projects that were highly rated and recommended for funding by the FirstEnergy Educational Advisory Council. A panel of educators and school administrators evaluated and endorsed the educational resources made available to schools and community groups. Project titles; teacher, school, and contact information; the project's purpose; materials used; a brief description of the work; and the teacher's conclusions and recommendations for others who might duplicate the project are listed. Project titles include: (1) "The Kindergarten Illuminating Math-Exploration Project"; (2) "Geology in the Environment"; (3) "Simple Machines"; (4) "Super Science"; (5) "Math a la Cart"; (6) "Power Town"; (7) "GEMS--Girls Excited about Math and Science"; (8) "Junior Electricians"; (9) "An Alarming Electricity Project"; (10) "Starry, Starry Night"; (11) "Electricity--At What Cost?"; (12) "Energy Fair"; (13) "Circuit City"; (14) "Sources of Electricity"; and (15) "Building a Kite". (SAH)

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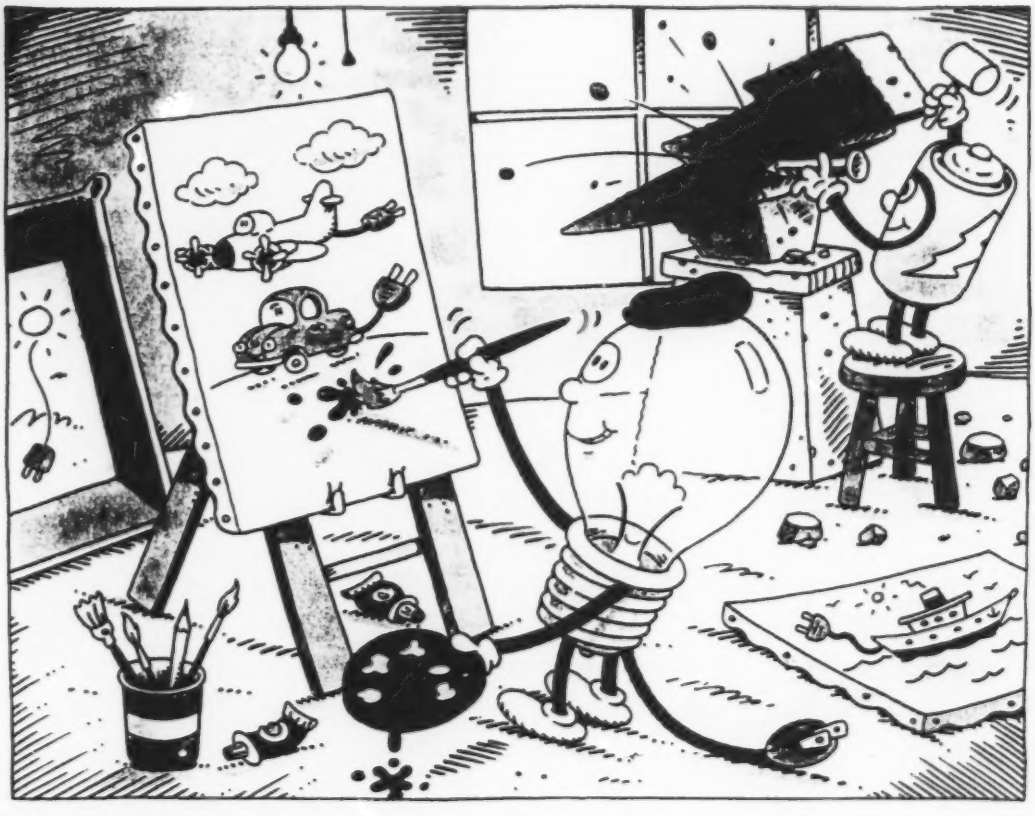
Delores Jones

BRIGHT IDEAS for educators



CREATIVE PROJECTS BY RECIPIENTS OF FIRSTENERGY'S MATHEMATICS, SCIENCE AND TECHNOLOGY EDUCATION GRANTS

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Dear Educator:

Since 1985, FirstEnergy and its electric utility operating companies – Ohio Edison, The Illuminating Company, Toledo Edison, and Penn Power – have awarded more than 800 Mathematics, Science and Technology Education Grants to educators who develop creative classroom projects that make learning fun for students.

We've funded projects that have included everything from teaching youngsters about electric safety, magnetism, computers and robotics, to those that make learning about the physics of kites, superconductors and high-speed transportation captivating for high school students.

Bright Ideas for Educators features some of the projects that were highly rated and recommended for funding by the FirstEnergy Educational Advisory Council. This panel of educators and school administrators evaluates and endorses the educational resources we make available to schools and community groups.

We've included project titles; teacher, school, and contact information; the project's purpose; materials used; a brief description of the work; and the teachers' conclusions and recommendations for others who may want to duplicate the project.

Please feel free to contact any of the educators who developed and carried out the enclosed projects. They would be happy to discuss these and other ideas for incorporating mathematics, science and technology into your curriculum.

For more information on the educational resources FirstEnergy makes available, free of charge to schools, youth and community groups, visit our Web site at **www.firstenergycorp.com/community**, call or visit the Area Manager at your local office, or contact the Community Support Department, FirstEnergy Corp., 76 S. Main St., Akron, OH 44308; 330-384-5022.

We're always pleased to be of service to educators.

FirstEnergy

K

The Kindergarten Illuminating Math-Exploration Project

Grade: Kindergarten
Mathematics

Teacher:
Cindy Dressel

School:
Jefferson Elementary
903 Fifth Street, SW
Warren, Ohio 44485
(330) 841-2401

Purpose:
To help students learn concrete math and critical thinking skills using a light box and other manipulatives to explore such concepts as counting, sorting, estimating, and adding.

Materials:
Purchased from Lakeshore Company
- Light box
- Light Box Math Manipulative Library: Translucent Fish, Shimmering Shapes, Sparkling Gems, and Sparkling Shells
- Light Box Math Manipulative Activity Mats: Sorting, Estimating, Patterning, Comparison, and Graphing
- Crystal Lego Blocks

The Work:
After teacher demonstration and exploration learning, the students developed the light center. For the remainder of the school year, students went to the center daily to use the light box, manipulatives, and activity mats to complete the required work. Activities included:
- Creating a variety of patterns and simple geometric shapes
- Comparing and ordering objects of different sizes and lengths
- Separating, joining, and ordering sets of objects
- Estimating the number of items in a set using comparisons
- Reproducing teacher-directed activities and creating something on their own

Parent volunteers assisted the students at the light center.

In Conclusion:
"The children were delighted with the light box and enthused about using their math skills. This was a creative, hands-on activity that used concrete objects to do math. Soon the students were looking for other objects that might let light through, thus a science unit was developed to discuss the properties of light. The children also began putting paper on the light box to draw or trace pictures to use in art. The results were better than I expected. The children had never experienced the rewards of working with a light box. They became very creative with it, experimenting and evaluating their own and others' work."

C. Dressel

Geology In The Environment – A Workshop for Science Teachers

GRADE: K-8
Science Education

TEACHER:
Eileen Bodendorfer, *Director*

SCHOOL:
Industrial Information Institute for Education, Inc.
One University Plaza
Youngstown, Ohio 44555
(330) 742-2314

PURPOSE:
To address the Science As Inquiry Standard, science teachers received instruction in scientific inquiry skills of observation, investigation, the use of appropriate tools, data collection, mathematics, critical thinking, and oral and written communication appropriate to the classroom and grade level of their students. Participants were instructed in the use of appropriate tools, measurement, samples, and models to investigate geological concepts. They also received instruction in integrating science into other content areas, formats to help students organize their collected data, reporting formats for students, and assessment ideas for the inquiry processes. The methods of inquiry were linked to interdisciplinary lessons and to learning outcomes required by the Ohio Proficiency Test and the Correlation Chart for Learner Outcomes in Science Curriculum for Grades K-8 for school districts in Western Pennsylvania.

MATERIALS:
- Stipends for six instructors
- Mailings to all schools in Ashtabula, Columbiana, Mahoning and Trumbull counties in Ohio and Mercer County in Pennsylvania
- Printing brochures and handouts for science teachers
- Audio-visual materials and equipment rental
- Rock sample collection
- Lesson plans
- Bibiography
- Slides and other teaching resources

THE WORK:
The Science Workshop Planning Team, a group of 15 science educators from throughout the five-county area, met in May, June, July, and September 1999, to plan the workshop. Brochures were mailed to all schools on September 1. The deadline for registration was October 14. Committee members finalized presentation details, prepared an evaluation form and made arrangements for the meeting location, hospitality, registration and refreshments. Nametags and handout materials were printed in advance. Stipends for the presenters were prepared by the director of the Institute. Educational resource materials were collected and distributed to participants.

IN CONCLUSION:
"We were surprised and pleased by the overwhelming response to the workshop. One hundred and fifty-six science teachers from 33 school districts participated in the workshop on October 20, 1999. Evaluations were excellent and included many requests for future workshops. The presentations were very practical and the handout materials were especially appreciated. Future workshops will be based on areas of need expressed by the science teachers in attendance."

E. Bodendorfer

2

Simple Machines

GRADE 2:
All subjects

TEACHER:
James A. Huddleston

SCHOOL:
Monclova Primary
8035 Monclova Road
Monclova, Ohio 43542
(419) 865-9408

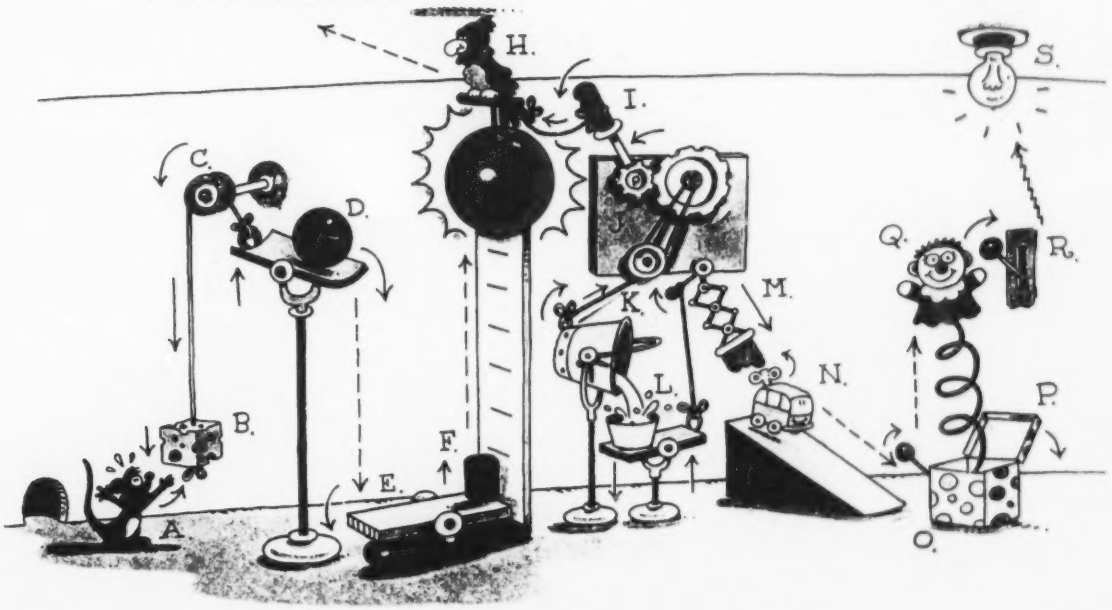
PURPOSE:
To teach students about simple machines including inclined planes, pulleys, gears, wheels, axles, and levers. Students constructed various types of machines using the K-Nex System®.

MATERIALS:
- K-Nex System®
- Screwdrivers
- Hammers
- Pliers
- Wire cutters
- Materials donated to be disassembled: clocks, radios, circular saw, telephones, VCR

THE WORK:
Working in small groups and using the exploration cards of the K-Nex System®, students built and explained various simple machines. Problem solving was a major focus in that the students had to determine which pieces from the K-Nex System® kit were required to build the needed machine. As a side activity, the students disassembled and carefully examined various donated household appliances to see how simple machines affect more complex machines. The entire class, working as a team, created a four-foot-tall Rube Goldberg Team Project Machine. As an outside project, each student had to build a fully operational machine to help with a chore around the home. A written report on this machine included the rationale for making it, how it made the job easier, and an explanation of how each of the simple machines contributed to the whole.

IN CONCLUSION:
"I was very pleased with the results. The children surpassed my expectations. By working in small groups, they developed a sense of teamwork and camaraderie. Student interest and excitement was very high, especially when they were able to dismantle the donated machines. I enjoyed watching the children create the Rube Goldberg machine. Although the project took almost a month to complete, interest never wavered and excitement concerning the completion was evident daily."

J. Huddleston



2

Super Science

Grade 2:
All subjects

Teacher:
Amy C. Murray

School:
Mercer Elementary School
301 Lamor Road
Mercer, PA 16137
(724) 662-5102

Purpose:
To involve 125 second-grade students and five teachers in hands-on experiments designed to nurture the students' curiosity about magnets and electricity. It was also hoped that students would learn to collaborate with each other at the science stations, assess the experiments, and develop an understanding of magnetism and electricity.

Materials:
- Magnet Exploration Kit (ETA Science)
- Electrical Supply Kit (Hands-On Science)
- Electricity and Magnetism Cluster (Hands-On Science)
- Adventures in Science – Electricity (Summit Learning)
- Adventures in Science – Magnetism (Summit Learning)

The Work:
Created 16 hands-on activity stations involving electricity and magnetism:
- Making and Using My Magnet Book
- What Will a Magnet Attract?
- Mighty Magnet
- Measuring the Strength of Magnets
- Fish and Clips
- Will a Magnet Attract Through These?
- Making Magnets
- Make a Compass
- Different Strokes
- Creating Static Electricity
- What Causes Static Electricity?
- Safety Rules to Follow During an Electrical Storm
- Light Bright
- On Or Off? -Testing Electrical Conductivity of Various Objects
- How Does Electricity Flow Into A Light Bulb?
- Biographies/Electricity Time Line

Pairs of trained student volunteers guided other students through the stations. One day each month was Super Science Day. Students from other second grade classes were divided into groups of four or five and spent ten minutes at each of the five stations set up for the day. The two student volunteers conducted the experiments, actively engaged the other second-graders and helped them understand the principles. Afterwards, the students wrote in their journals about their experiences and what they learned. By the end of the year, every second-grade student in the school had visited each of the 16 stations.

In Conclusion:
"This project was a definite success. The results were beyond my expectations. Not only did they enjoy the activities, they verbally described what they learned during the activities. I believe the students learned a great deal and were given the opportunity to rethink some misconceptions they had about magnetism and electricity. I would suggest that teachers who wish to duplicate this project feel free to use or adapt some of the MANY activities already out there and avoid re-inventing the wheel. Also, I plan to give each of the student pairs the opportunity to create a science experiment of their own involving magnetism and electricity."

A. Murray

3

Math A La Cart

GRADE 3:
Mathematics

TEACHER:
Peg Klingenberg

SCHOOL:
Thomas Jefferson Elementary
Lakeshore Boulevard
Eastlake, Ohio 44095
(440) 942-7244

PURPOSE:
- To increase problem-solving skills by using activity packets to reinforce, enrich, and extend the skills covered in the eight strands of Ohio's math proficiency test
- To provide students with opportunities to use appropriate math tools in a hands-on approach to problem solving
- To provide tutors, volunteers, parent helpers and students working both outside and within the classroom with "portable" math activities

MATERIALS:
Teacher resources for skill activities
- Geometry for Primary Grades (Steck-Vaughn)
- From Carson-Dellosa, Publisher
  - -Math Problems
  - -Word Problems
  - -Lifeskills: Everyday Math
- From Educator's Outlet:
  - -Communicating Math With Color Tiles
  - -Beginning Algebra Thinking
  - -Hands-On Measurement
  - -Time & Money
  - -Daily Math Activities
  - -Activity Math
  - -Critical Thinking
- From Learning Resources:
  - -Data, Chance & Probability
  - -Geometry & Fractions with Geoboards
  - -Calculator Connections
  - -Making Sense of Fractions
  - -Manipulatives/Math Tools
- Double-sided plastic Geoboards
- Overhead Circular Geoboard
- Calc-U-Vue student calculators
- Red dice
- 1-6 number spinners
- Coin and bill sets
- Overhead clock dials
- Large number cubes
- Basic fractions activity cards
- 3-meter retractable tape
- Storage trolleys

THE WORK:

Step 1 - Activities preparation
Resource books and manipulatives were organized according to the eight strands of the math proficiency test. A minimum of 10 individual skill activities were selected for each strands. The problem-solving activities, evaluation sheets and appropriate manipulatives were placed in individual zip-lock bags, labeled accordingly, and placed in one of the eight math strand containers of the portable math activity cart.

Step 2 - Student menus
Based upon the previous year's proficiency profile, observations, assessments, and analyses of the students' weak areas, specific skill baskets were assigned to each student. A master chart of the appropriate skill activities was provided for the student and put in a storage file that hung above the portable math activity cart.

Step 3 - Implementation
The portable math cart was used when daily assignments were completed. Students had to complete a specific activity from their menu each week. The cart was also available to the tutors, helpers, volunteers, and parents who worked with students outside the classroom. Individual baskets or the entire cart could "travel" with the student and tutor. A student would get the menu from the folder storage file, be directed to a specific skill area basket, select an activity from the skill list, and gather the manipulatives to carry out the activity. Upon completion, the student filled out the answer sheet, turned it in, and checked off the activity from the master chart. All materials were then returned to the portable cart.

IN CONCLUSION:
"Math A La Cart provided many opportunities to involve students in manipulative activities. They really enjoyed having a choice of activities, which motivated them to want to solve problems. The activities made learning fun for them, as I had expected it would. In assessing growth and improvement by looking at daily work and continual progress in solving problems within the activities, I have been very pleased with the students' work."

P. Klingenberg

3

Power Town

GRADE: 3
All subjects

TEACHERS:
Carolyn Dehner and Judith Lehmer

SCHOOL:
Hopkins Elementary School
7565 Hopkins Road
Mentor, Ohio 44060
(440) 974-5268

PURPOSE:
As a culminating activity to an integrated unit of study on energy, students designed and created a scale model of a community with three-dimensional buildings and an electrical network to power lights within the city.

MATERIALS:
- Ohio Energy Project membership and materials
- Particleboard
- Wire
- Small posts
- Connectors
- Large batteries for generators
- Low-voltage lighting

THE WORK:
The project was carried out over a six-week period and included:
- Developing a concept web consisting of types of energy, resources, uses, safety factors, and a historical perspective with a focus on electricity
- Activities/experiments in the FOSS Science Kit on magnetism and electricity
- Students read the biography of Thomas A. Edison and completed the Science Court computer program on electricity.
- The class visited the Porter Science Center for additional hands-on lessons.
- Students designed and created a map of the city using the Tom Snyder software, Neighborhood Map Machine and Community Construction Kit.
- Students used the knowledge they acquired to construct the scale model of their electrified city.

IN CONCLUSION:
"The project resulted in an exciting and positive learning experience for teachers, students, and parents. The children were very enthusiastic about the unit of study. Their learning and interest exceeded our expectations. A deeper understanding of the material resulted because of the various ways/formats in which it was presented, experimented with, and applied. The unit integrated well with all content areas, allowing for connections to be made and richer, deeper learning to occur."

C. Dehner and J. Lehmer

3-5

GEMS - Girls Excited About Math and Science

GRADES: 3-5
All subjects

TEACHER:
Ruth Brickley

SCHOOL:
Smith Elementary School
535 Wyleswood Drive
Berea, Ohio 44017
(440) 234-2797

PURPOSE:
To provide meaningful opportunities for girls to experience math and science – specifically physics, electricity, and magnets – and to better understand their major concepts. To provide young girls with hands-on math and science experiences outside of the normal classroom, where the fear of grades can stifle creativity and success.

MATERIALS:
From AIMS Education Foundation:
- Mostly Magnets
- Electrical Connections
- Hard Hatting In A Geo-World
- Soap Films and Bubbles
- Energy Balls and Electrical Supply Kit - NASCO
- Sticky notes, iron filings, sand, lunch bags, string, aluminum foil, plastic cups, tweezers, plastic bags, large needles, pie plates, and construction paper

THE WORK:
Invitations went out to 85 girls in grades 3-5. Due to limited space, the GEMS group was limited to the first 30 who signed up. During the next four months, ten one-hour evening meetings were scheduled. Using selected AIMS lessons as a focus, the students explored such diverse topics as:
- Structures
- Pillars of Strength
- Thanks For Your Support
- Bridge It
- Fun Stuff
- The Human Body
- Heat, Light and Sound
- The Water Cycle
- Magnets and Electricity
- Fish and Clips
- Through it All
- How Close Can You Get?

After each session students reflected on the activity by writing in a journal. At the final session, students and parents completed evaluation forms and discussed topics to consider for next year.

IN CONCLUSION:
"I was very pleased with the outcomes of the project and student participation. The girls had excellent questions and developed their thinking skills through the activities we shared. Their journal recordings were very insightful and usually very positive. All expressed a desire to sign-up for the next school year. Before undertaking this project, I would suggest teachers attend an AIMS summer workshop to learn the philosophy behind their program and activities."

R. Brickley

4

Junior Electricians

GRADE: 4
Science

TEACHER:
John Bietzel

SCHOOL:
Eagle Heights Academy
1833 Market Street
Youngstown, Ohio 44507
(330) 742-9090

PURPOSE:
Students will identify and demonstrate how electricity is made, develop a wiring plan, create a parallel circuit, and identify and install a power source. To evaluate student knowledge, they designed and constructed a model house that contained working lights, switches, and a parallel circuit design.

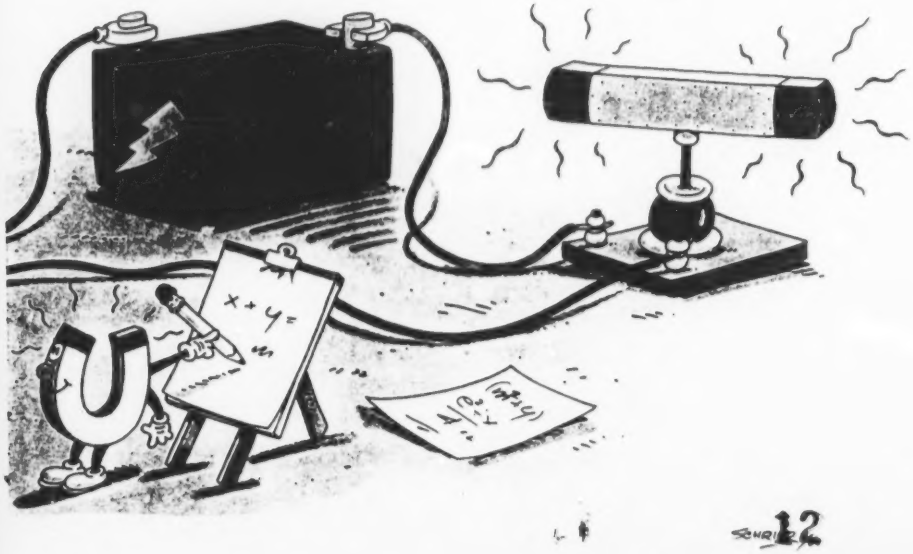
MATERIALS:
- Copper wire
- Alkaline batteries (9-volt)
- Battery holders
- Toggle switches
- Plywood
- Small light bulbs
- Miscellaneous building materials

THE WORK:
After the instructor introduced the unit on electricity, students:
- Learned to create a parallel circuit during a mini-lab experience;
- Constructed a homemade switch using simple materials;
- Compared and contrasted conductors and insulators;
- Viewed award-winning house construction projects from past years;
- Used old electronics for house parts during an electronics "junk day"; and
- Designed and began construction of their model house at school and completed them at home.

A rubric was used to evaluate the success of the model houses. The rubric consisted of a checklist of required items including, four working lights, working switches, at least one parallel circuit, quality of construction, and creativity.

IN CONCLUSION:
"I was very pleased with the results. Both student and parent involvement were above what I expected. The students felt they were not only involved, but were true instruments in their own learning. The sense of pride and accomplishment was deeply ingrained within every student who completed the project."

J. Bietzel



4

An Alarming Electricity Project

GRADE 4:
All subjects

TEACHER:
Karen Loychik

SCHOOL:
Dobbins Elementary School
3030 Dobbins Road
Poland, Ohio 44514
(330) 757-7011

PURPOSE:
This was the culminating activity for a unit on electricity. Students put to use their knowledge of electrical circuits and switches by designing a pencil box burglar alarm.

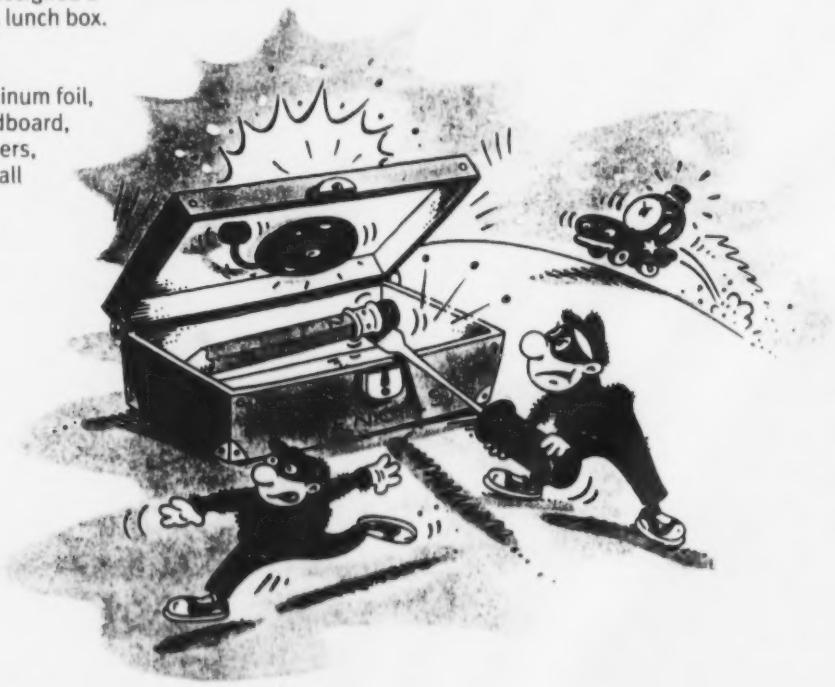
A book that the students had recently read, "Dear Mr. Henshaw" by Beverly Cleary, served as the stimulus for this project. In the book, the main character designed a burglar alarm for his lunch box.

MATERIALS:
- Pencil boxes, aluminum foil, masking tape, cardboard, electric bells, buzzers, wire, switches, small light bulbs, and batteries

THE WORK:
Working in small groups, students were given a battery, light bulb, and electric wire and instructed on how to make a complete electrical circuit to light the bulb. Students were then instructed on how to insert an electrical switch into the circuit and the differences between series and parallel circuits. Using this information, they were then given the task of designing and building a quiz board using cardboard, aluminum foil, masking tape, a battery, bulb, and wire. Finally, the students designed and built their pencil box burglar alarms. For all of the projects, students recorded in their science journals their designs, observations, results, and conclusions for the various investigations into electrical circuitry.

IN CONCLUSION:
"Students successfully completed the projects and seemed to have a real understanding of complete circuits. The project experiences aided in their understanding of how a complete circuit works. I was pleased with the project. Having the students working in small groups was helpful. The students who finished their projects then helped students who were having difficulty."

K. Loychik



5

Starry, Starry Night

GRADE 5:
All subjects

TEACHER:
Rebecca S. Reiter

SCHOOL:
St. Paul School
1580 Brown Street
Akron, Ohio 44301
(330) 724-1253

PURPOSE:
Exploration of the solar system is combined with the properties of electricity to provide students with an exciting hands-on approach to discovering how an electric circuit works. Each student will use research and report writing skills to study a constellation of their choice. After completing several introductory activities on electrical circuitry, the students will construct an illuminated constellation board. This illuminates the constellation and provides a diagram of the electrical circuitry.

MATERIALS:
- "D" batteries, 600-count light strands, pegboard, black spray paint, electrical tape, wire cutters, end caps, paper clips, brass-plated fasteners, contact cement, and thumbtacks

THE WORK:
Students spent one week conducting five activities from Science in a Nutshell/Electrical Connections, while learning about basic electrical terminology and how to create series and parallel circuits. They then researched a constellation of their choice, its location in the late spring sky, and other interesting facts. The students then combined their knowledge of electrical circuitry and constellations to construct a constellation board using a 2' x 2' piece of pegboard spray-painted black, miniature Christmas tree lights, batteries, thumbtacks, and paperclips. The constellation board consisted of a series circuit shaped like the constellation, operated by a switch, powered by batteries, and illuminated with miniature Christmas tree lights. The students included a diagram of their circuits, a report about the constellation, and a creative title for the project. The students then demonstrated their constellation boards to visiting classes.

IN CONCLUSION:
Combining the science of electricity with the study of constellations was exciting for the children. The report writing, creative labeling, and circuitry illustrations allowed them to use their composition and art skills as well. More problems occurred than anticipated, however, with getting the series circuits to work consistently. To improve upon the project, I would have parents available to help, allow more time to implement the project, and use other materials such as battery holders or adjustable straps. I would definitely do the project again. Some of the students even gave up free time to work on the project. When students give up free time to do school work, it is a project worth doing again."

R. Reiter

6

Electricity – At What Cost?

Grade 6:
Science

Teacher:
Thomas LaMoreaux

School:
Columbia Middle School
13646 West River Road
Columbia Station, Ohio 44028
(440) 236-5741

Purpose:
To increase student awareness of the monetary and environmental impact of electric energy usage in the home. Students will first measure overall monthly kilowatt hours of electric usage by household appliances in their home and then compete with other members of the class and the teacher to reduce overall monthly electric usage. Students will also evaluate various alternate energy sources as a means of satisfying their household electricity needs.

Materials:
- Watts Up? Meter, Teacher's Guide, and Student Workbook – ETA Science
- Student awards

The Work:
A letter was sent home explaining the project to parents and asking them to share and discuss the previous month's household electric bill with their student. Each student calculated a daily average kilowatt-hour usage for his or her home. The "Watts Up? Meter" was used to measure cumulative electricity consumption in watts and watt-hours for various appliances, as well as dollars and cents, assuming an average charge of approximately $0.11 per kilowatt-hour used. Each student organized the data into a spreadsheet and attempted to reduce the total kilowatt-hours used for the next month. In the classroom, alternate energy sources were discussed and investigated by the students. These energy sources were compared to fossil fuel sources both monetarily and environmentally. At the end of the month, students presented written and oral reports on alternate energy sources as possible sources of electricity, and how they reduced their daily kilowatt-hour usage for the previous month. The student who lowered his or her usage by the greatest percentage received a prize. If any student lowered his or her percentage greater than the teacher, that science class received a free recess.

In Conclusion:
"The results of this project were even better than expected. Parent involvement was high and they were very pleased at the awareness of the students as to electric costs and usage. This project is extremely flexible and can be carried out while involved in another unit. The inclusion of both math and computer teachers was a definite plus."

T. LaMoreaux

7

Energy Fair

GRADE: 7
Chemistry & Physics

TEACHER:
Cheryl Porter

SCHOOL:
Willetts Middle School
1045 Hadcock Road
Brunswick, Ohio 44212
(330) 225-7731

PURPOSE:
To have students host an Energy Fair for the school and community. Students will develop and teach at various stations a variety of hands-on, energy related projects, which visitors will be able to work on and take with them. The projects include:

- Energy demonstrated by the change of temperature (Participants make ice cream and measure before and after temperatures.)
- Energy demonstrated through a magnetic force (Participants make electromagnets.)
- Energy demonstrated by movement of air (Participants make windmill pencils propelled by a balloon.)
- Energy produced and stored through photosynthesis (Participants learn how plants make and use nutrients by growing their own plants.)

MATERIALS:

- Paper, copper wire, nails, batteries, milk, rock salt, plastic bags, vanilla, mouse traps, balloons, pencils, straws, plant materials, food materials

THE WORK:
In early January, students generated ideas and researched energy sources for the fair booth activities. Students then created a pamphlet with scientific descriptions of each activity and organized the following:

- Materials to be bought and used
- Contacts for outside sponsors
- Charts and instructions for each booth activity
- Invitations to other schools
- Flyers for neighborhood stores
- Cable TV and newspaper contacts

Upon completion, students presented their activity to classmates. After peer review, changes were made and a final "dress rehearsal" was made to the class. The "Energy Fair" was presented in April, prior to Spring break.

IN CONCLUSION:
"The results were better than I expected. The students demonstrated patience and eagerness. Over 200 people attended and were very impressed. The students instructed their visitors in the how and why of their subjects in a hands-on approach to science that had everyone talking and eating (ice cream and cotton candy). I suggest that teachers be specific in instructions, delegate, have specific timelines, notify parents about the magnitude of this project and seek their help in evaluating students and their results."

C. Porter

7-8

Circuit City

GRADES: 7-8
Science

TEACHERS:
David Sandys and Jahnine Blosser

SCHOOL:
East Toledo Junior High
355 Dearborn Avenue
Toledo, Ohio 43605
(419) 691-4692

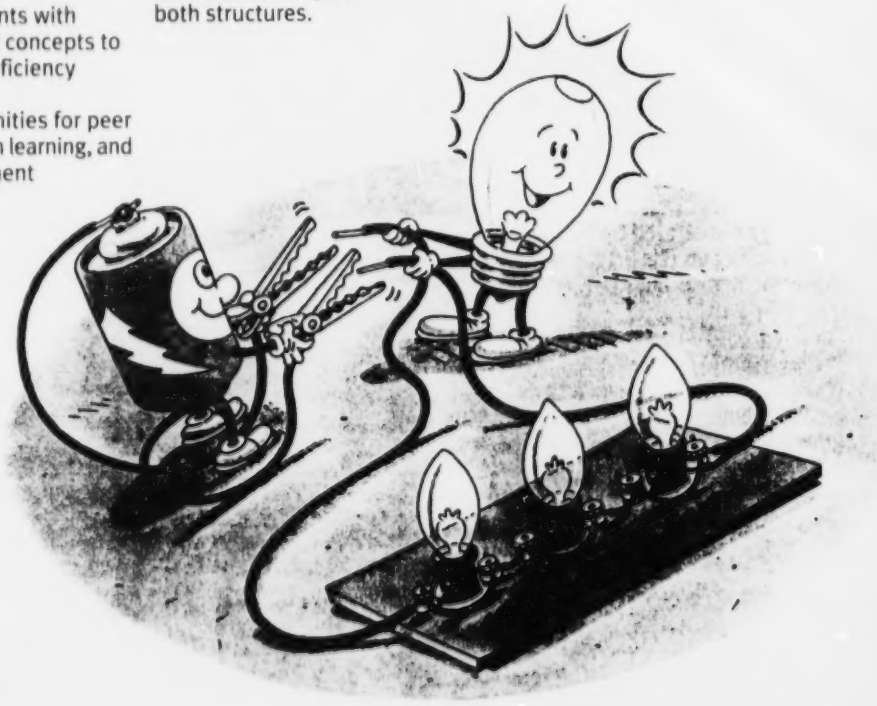
PURPOSE:
- To create a large-scale circuit board where students and parents can build and explore parallel and series circuits to understand how electricity flows in a city
- To have students trace energy transformation in an electrical system
- To familiarize students with electrical terms and concepts to positively affect proficiency test scores
- To provide opportunities for peer teaching, exploration learning, and embedded assessment

MATERIALS:
- Plywood sheets, balsa wood, light bulbs, light bases, switches, battery holders, batteries, tools, wood dowels, paint, alligator clips, buzzers

THE WORK:
As a class project to enter in the school's Energy Carnival, students built Circuit City. After the materials were purchased and assembled, students downloaded building models from the Internet. Buildings were attached to a 4'x 4' plywood board, bulbs were placed in buildings, and the city was wired. Students, working in teams, followed various "work orders" to route electrical power from the power plant (batteries) to the various buildings. Work orders included series circuits, parallel circuits, switches and doorbells (buzzers). Specific tasks were developed such as wiring two buildings so that one switch controlled the lights in both structures.

IN CONCLUSION:
"The students enjoyed all phases of the project, which was very effective in meeting the objectives. Student involvement was very high, peer teaching occurred frequently, students often shared thoughts and ideas in cooperative problem solving, and all had fun. One of the secrets to the success of this project is to let the students do as much of the work as possible."

D. Sandys and J. Blosser



7-8

Sources of Electricity

GRADE: 7-8
Science and Algebra

TEACHER:
Nancy Pevets

SCHOOL:
Eisenhower Middle School
331 North Curtice Road
Oregon, Ohio 43618

PURPOSE:
Students studied various sources of electricity by constructing dry and wet cells, an electromagnet, thermocouple, and a simple electric generator. Using a multimeter, they measured the voltage, current, and electrical resistance produced by each of the devices. Students learned about the nature of electricity, electrical circuitry, circuit diagrams, and Ohm's law.

MATERIALS:
- Economy analog multimeters, copper wire, iron wire, strips of copper and zinc, beakers, ammonium chloride and salt solutions, styrofoam cups, rubber bands, masking tape, filter paper, batteries: (AA, AAA, D and 9-volt), bar magnets, and matches

THE WORK:
Students were introduced to the nature of electricity, charges, electric current, voltage, resistance, circuitry, and batteries. They then conducted experiments to discover how charged materials interact and constructed electric circuits by reading diagrams. They used dry and wet cells, an electromagnet, thermocouple, and a simple generator.

The students used the multimeter to measure current, voltage, and electrical resistance of the devices. Ohm's law was presented and the students practiced rearranging this equation for the variables. The effectiveness of this project was measured by student responses on teacher-constructed lab sheets, periodic quizzes, and a cumulative test.

IN CONCLUSION:
"The students were enthused about the projects, activities, and labs. I teach general-level science classes and the test scores were actually higher than I expected. I think this increase was due to the high student interest in all of the activities."

N. Pevets

High School

Building A Kite

Grade: High School
Algebra and geometry

Teacher:
Rebecca Nickoli

School:
Norwalk High School
80 East Main Street
Norwalk, Ohio 44857
(419) 668-2079

Purpose:
To have students use mathematics and physics as tools to design and build a kite capable of sustained flight.

Materials:
- Wood strips (bead board)
- Glue
- Plastic and fabric covering
- Kite string

The Work:
Students first studied the history of kites and kite making. Using applied physics, students evaluated different styles of kites (two-stick, hexagon, box) as to how well each would fly. After discussing the merits of each basic design type, student pairs designed a kite of their own. Each team had to measure the total surface area of their kite and all angles. Students then chose the construction materials, cut out the various parts, and assembled the kite in class. The kite designs were tested on the football field. Upon completion of the project, students submitted a paper that included an evaluation of the design and suggested improvements.

In Conclusion:
"Students enjoyed this project. In addition to learning the history of kites, students became aware of the need for exact measurements, how to work in teams, and how to solve problems. We all learned that things do not always go as planned. Teachers interested in duplicating this project should be aware of the importance of using the lightest wood (or substitute material) possible for the spines and spars of the kites. Also, the physics teacher can be invited into your class to discuss such concepts as flight, lift, and wind properties."

R. Nickoli

FirstEnergy

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